GRADIENT FIELD IMPLODING LINER FUSION PROPULSION SYSTEM

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Magneto-inertial fusion: A pulsed high current discharge in a cylindrical coil generates a rapidly changing axial magnetic field (dB_z/dt) to induce a counter-propagating current in the liner of a centrally aligned target. The Lorentz force arising from the axial field and liner current rapidly implodes the target to achieve fusion densities and temperatures.

Issues for space propulsion:

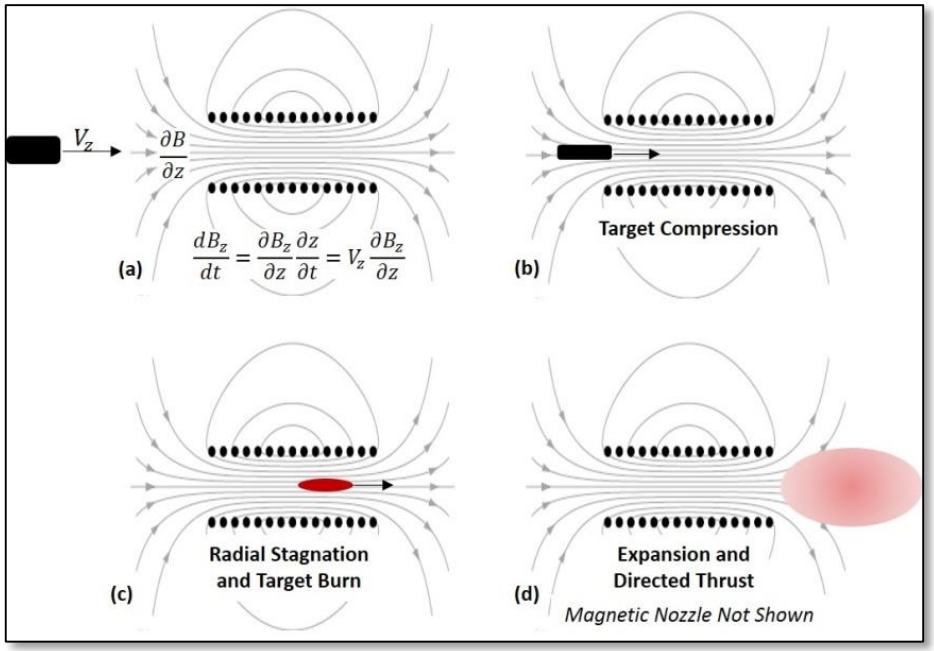
- Repetitively pulsed high current coil, high power switches, thermal losses
- Accurate target placement, timing

Innovation:

- Replace the rapidly pulsed coil and stationary target with a fast moving target fired into a static, high gradient magnetic field (superconducting coil)

Concept Challenges:

- Target acceleration (several km/s)
- Magnetic field design (fields required to compress, burn, expand and detach)
- Target design and compression physics
- Mission analysis and SOA comparison



Sequence during each pulse:

a) Target acceleration into gradient field at high axial velocity
b) Induced liner currents compress target to initiate fusion
c) High B-field maintains compression as target moves through coil
d) Plasma expansion and detachment in magnetic nozzle region